

On-site electric current measurement to improve Smart Grid design

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New and improved technology for measuring power quality in smart grids could save 839k tonnes of carbon and bring £250 million annual GVA in economic benefit. The technology has been developed by scientists at the Centre for Carbon Measurement, part of the National Physical Laboratory (NPL), the UK's National Measurement Institute.

The growing complexity of the increasingly demanding and decentralised system for generating and distributing energy to homes and businesses creates many opportunities for power quality to be compromised. [Smart Grids](#) address this by managing and monitoring electricity throughout networks such as the National Grid. Electricity information is used to improve distribution and support integration of new power sources, such as [renewables](#) - where power generation is more volatile.

To minimise compromises, and maximise efficiency, real-time monitoring of power quality in the grid is essential. A technology developed by the Centre for Carbon Measurement provides one of the most accurate portable methods of making these measurements, and initial projects alone look set to produce huge carbon reductions.

The technology is a 'metrology grade' digitizer. It takes sample measurements of current and voltage using non-[invasive techniques](#) at about 25,000 times per second, and sends these measurements to an analogue to digital converter. It can then carry out real time maths using NPL developed algorithms to calculate various parameters relating to

power quality.

These levels of accuracy were previously confined to the laboratory, but can now be made in the field. Measurements can be made at several points throughout the grid and compared.

The team that designed the digitiser used it to study power quality on one of the most challenging components of the Smart Grid – a large scale photovoltaic array (PV) installation. The findings will enable grid planners to anticipate and sidestep several potential pitfalls in the design of the future grid and thus should make a highly significant contribution to carbon reduction.

An independent report by Technologia, a consultancy, calculated that the projected carbon savings from this project could be as much as 167k tonnes and would bring £50m of [economic benefit](#) each year from the retail value of the increased electricity output of solar cells.

The system is now being used in Belgium, Denmark and Turkey, helping scientists assess the impact of renewable electricity on the Smart [Grid](#) and plan for ambitious energy transmission schemes. Two more are being used in Sweden to monitor the power quality of a 255 kilometre submarine cable between Sweden and Poland.

If the impact of the five digitizers in use across Europe is comparable, as is suspected, the total annual benefits delivered would be 839k tonnes of carbon savings and up to £250 million GVA.

The digitiser was also shortlisted for a Climate Week Award earlier this month.

NPL is now planning to licence the proprietary digitiser design to a commercial instrument supplier which will massively expand the user

base and greatly enhance its influence on the architecture and composition of the Smart Grids of the future.

More information: NPL will be holding an event, Measurement to Enable Smart and Intelligent Grids, with the Royal Academy of Engineering the Energy Networks Association, on 1st May 2013. Details here: <http://www.npl.co.uk/events/1-may-2013-measurement-to-enable-smart-and-intelligent-grids>.

Provided by National Physical Laboratory

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